Argonne NATIONAL LABORATORY

ARGONNE DISCOVERS NEW WAY TO **CONVERT CARBON DIOXIDE INTO LIQUID CHEMICALS**

THE CHALLENGE

Producing chemicals in the conventional way requires us to burn fossil fuel and produces carbon emissions. We must reduce or reuse carbon emissions during industrial processes to meet our nation's net zero emissions goals.

Carbon dioxide generated from fossil fuel power plants and from industrial fermentation plants can be used for producing common chemicals. However, carbon dioxide is a very stable molecule. Converting it into a different molecule takes energy and capital.

Developing a new form of catalyst can accelerate such conversion. In fact, catalysts help produce more than 80 percent of all manufactured goods.

THE INNOVATION

A research team, led by the U.S. Department of Energy's (DOE) Argonne National Laboratory in collaboration with Northern Illinois University, discovered an electrocatalyst that converts carbon dioxide and water into ethanol. The electrocatalyst demonstrates very high energy efficiency with high selectivity for the desired final product at low cost.

The catalyst consists of atomically dispersed copper on a carbon-powder support. Through an electrochemical reaction, this catalyst breaks down carbon dioxide and water molecules and selectively reassembles the broken molecules into ethanol under an external electric field. This process reuses more than 90 percent of the original molecule, which is a much higher percentage than any other reported processes. Furthermore, the catalyst operates stably over extended periods at low voltage.

THE IMPACT

Converting carbon dioxide and water molecules into ethanol is desirable because ethanol is used in nearly all U.S. gasoline. It also acts as an intermediate product in the chemical, pharmaceutical and cosmetics industries. Argonne's researchers believe the new electrocatalyst will reduce the amount of carbon emissions. They are also working on new catalysts that can transform carbon dioxide into other value-added chemicals.

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